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New method of "reading" strongly-correlated sequences: Treatment and analysis of the CCD-matrix noise

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Abstract

Description of random sequences in strongly-correlated systems with the help of β - distribution has been considered. This new method was applied to analysis of CCD-matrix noises recorded at different temperatures. Every noise sequence was "read" in terms of fitting parameters of the β - distribution. Relative fitting error does not exceed the value of 2.2% with the value of Pearson correlation coefficient close to 1. The fitting parameters are rather stable to a difference in treatment procedures. In first treatment method the procedure was applied to the mean values of the noise sequence, while in the second - to each separate sampling with subsequent averaging in the end. For the first method the relative error is located in the vicinity of 1%, while for the second approach this value is about 2.2%. This simple comparison confirms that the self-averaging phenomenon occurs as a result of repetition of the same measurement. With the help of the ECs method we recognized a hypothesis for temperature behavior of the mean values that were calculated for each sampling. This hypothesis represents itself in a linear combination of two exponential functions. One can judge about the temperature stability of the CCD device analyzing the fitting parameters with respect to the temperature. The method has potential application in device calibration or in determination its readiness to a normal work. © 2011 SPIE.

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Keywords

Beta-distribution, Calibration curves, CCD matrix, Eigen-coordinates method